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MAY 21, 1984

CHEMICAL & ENGINEERING

NEWS

Process control fast becoming "process management"
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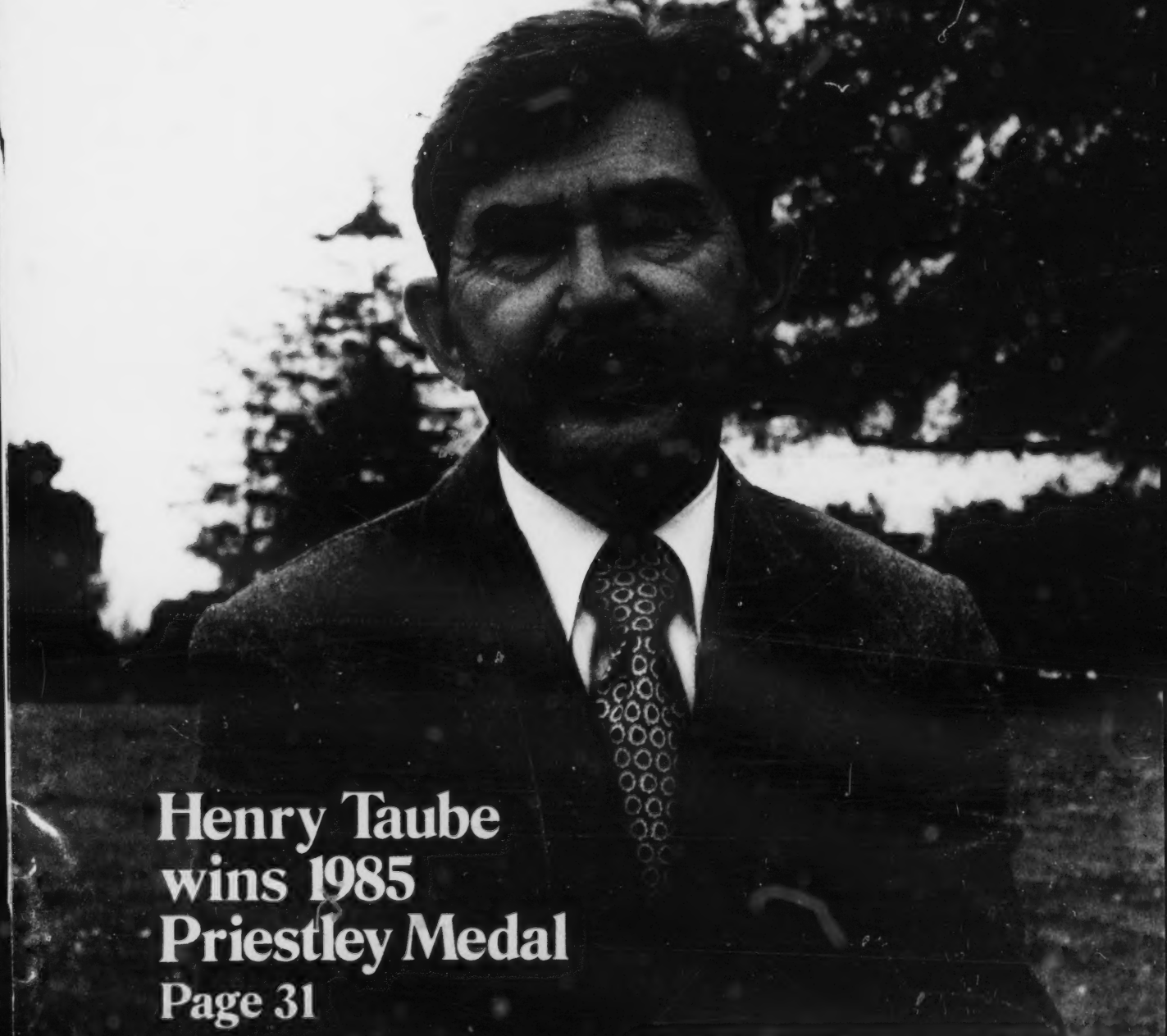

Henry Taube wins 1985 Priestley Medal

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MAY 21, 1984

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■ **USDA's human calorimeter will house volunteers for studies on nutrition.** **Page 5**

■ **Monsanto may have to pay the largest share to settle the agent orange suit.** **Page 5**

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Business

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Polymers output in 1983 regained much of the ground lost in 1982; drug firm earnings rose 12% in first-quarter 1984. **Page 20**

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World Resources Institute conference indicates environmentalist groups, industry are willing to work together; representatives of universities ask federal support to build, equip labs. **Page 24**

Priestley Medal

Nobel Laureate Henry Taube, professor of chemistry at Stanford University, receives ACS's 1985 Priestley Medal. **Page 31**

Technology

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IUPAC commission proposes a system to name copolymers; chemistry lab on Arizona campus named for Carl Marvel. **Page 35**

Books

"Alan Turing: The Engima" details the tragic life of the father of the modern computer, who committed suicide at age 41. **Page 36**

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News Focus

Process control concept is now incorporating both supervisory and management levels. **Page 7**

RESEARCH INSTRUMENTS: One fourth of academe's are obsolete

In the past few years a number of studies have emerged bemoaning the shoddy state of academic research equipment, but the evidence has been mostly anecdotal. Now the National Science Foundation has some hard evidence to back up the claim. A new survey finds that one fourth of U.S. academic research equipment is classified as obsolete by the scientists who use it, whereas only 16% is characterized as being state of the art.

This first phase of NSF's National Survey of Academic Research Instruments & Instrumentation needs covers the amount, condition, and cost of existing scientific research equipment systems in calendar year 1982 in three selected fields—computer sciences, physical sciences, and engineering. Data on research equipment systems costing between $10,000 and $1 million provided by department heads and investigators in each field were used to obtain national estimates.

A second phase of the survey covers other fields and is due out next year.

Of the 10,181 instruments in the physical sciences research systems inventory, 1% were not yet in use, 14% were state of the art, and 24% were obsolete; 60% were designated in the survey as other. The figures were similar for the 5839 items in the chemistry inventory—1% not yet in use, 14% state of the art, 22% obsolete, and 63% other.

For engineering, 3% of the 8559 instruments in the inventory were not in use, 18% were state of the art, 24% obsolete, and 55% other. Of the 778 instrument systems in the chemical engineering inventory, 16% were state of the art, 19% obsolete, and 65% other. All were in use. For computer sciences, 6% of the 943 systems were not in use, 17% were obsolete, 18% were state of the art, and 59% other. The percentages for the 639 materials science instruments were 16% obsolete, 16% state of the art, and 74% designated other.

For all three fields combined, 24% of the more expensive research instruments (priced from $75,000 to $1 million) were classified as state of the art—30% in engineering, 22% in the physical sciences, and 18% in computer sciences fell into this category. Nearly all such equipment—98%—in the computer sciences had been acquired since 1978 compared to 80% in the physical sciences and engineering. Also, the study says, 84% of the equipment classified as state of the art was described as being in excellent condition, compared to 42% of all other research instruments in use.

In terms of its capability to enable investigators to pursue their major research interests, department heads rated the adequacy of their research equipment as: excellent—8%; adequate—46%; and insufficient—46%. More than 90% reported "important subject areas" of research could not be performed in their units because of lack of needed research instrumentation.

Data for NSF's research instruments survey were collected from a stratified probability sample of 43 universities selected from the 157 largest academic R&D performers. Inventories for all existing research equipment were obtained from institutions' central record-keeping systems and were sent to department heads for verification. More than 90% of both department heads and investigators responded to the survey.

NSF says that a more detailed analytical report covering this survey's results will be published later this year. Meanwhile, the second phase of the study, covering agricultural, biomedical, environmental, and medical sciences is currently under way, with final results expected to be available in 1985. NSF plans to update the complete survey periodically but isn't sure how often an update will be needed. □

NSF research instrument survey results at a glance

Status

- 2% not yet in use
- 16% state of the art
- 26% obsolete
- 56% other, in use

Age

- 45% 1 to 5 years
- 20% 6 to 10 years
- 31% more than 10 years

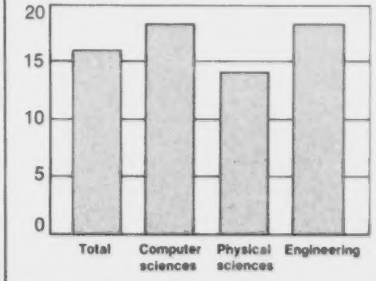
Purchase price

- 58% $10,000 to $24,999
- 31% $25,000 to $74,999
- 11% $75,000 to $1 million

Note: Based on 22,300 items in 1982 research equipment inventory in computer and physical sciences and engineering. **Source:** National Science Foundation

Only 16% of instruments are state of the art

Per cent of existing instrumentation that is state of art



Source: National Science Foundation

Sales, Earnings Up Moderately at Medium-Sized Chemical Firms

Combined operating profits of Second 50 firms rose 6.4% last year on sales gain of 3.5%; profitability increased to an average of 7.9% in 1983

William J. Storck, C&EN New York

The general economic upturn that buoyed the performance of the large chemical companies last year also boosted financial results of medium-sized chemical producers, but not with so much success.

The companies that make up C&EN's list of Second 50 chemical producers (ranked 51 through 100 in terms of chemical sales) rely in large part on making and selling chemical specialties, high-value-added downstream products. Demand for these specialties is not so cyclical as for basic chemicals, which are one of the mainstays of the larger producers. Consequently, the medium-sized companies are more resistant to both recessions and expansions than the larger firms. So it's not surprising that in last year's upturn, sales and earnings increased less for the Second 50 companies than for the Top 50 (C&EN, May 7, page 7).

Combined chemical sales for the Second 50 companies increased last year about 3.5% from 1982 to $17.9 billion, compared to a 6.3% sales gain (to a $101 billion total) for the Top 50. Second 50 chemical operating profits (sales minus costs of goods and general, selling, and administrative expenses), for those companies that report them, increased just 6.4% from the year before to $1.17 billion, compared with an 87% increase (to $6.60 billion) for the Top 50. And based on available data that are comparable year to year, identifiable chemical assets of the medium-sized firms rose an average of 6.8% to $11.96 billion.

The chemical industry in 1983

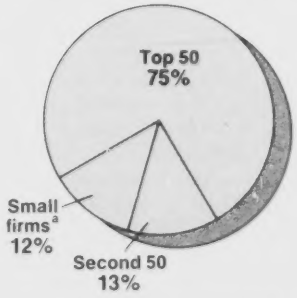
The U.S. chemical industry in 1983 paralleled the growth in the economy with about a 7% gain in sales. This increase about equals that of basic chemical production as determined by C&EN in its annual survey of Top 50 chemical products (C&EN, May 7, page 7). This is an indication that there was not much price action in chemicals last year, a view confirmed by many in the chemical industry.

The companies that sell chemical products include not only C&EN's lists of Top 50 and Second 50 chemical producers, but also companies that are too small to be included in the rankings and companies that either do not break out their chemical sales in annual reports or do not report or inadequately report chemical sales.

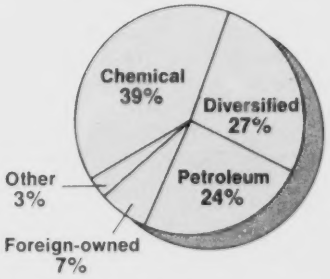
Of the $137 billion or so in chemical sales in the U.S. last year, the Top 50 producers accounted for about $101 billion or about 75%. The Second 50 producers sold about $18 billion of chemical products, or about 13% of all chemicals sold in the U.S. The remaining 12% was sold by companies too small to make the rankings, and companies that do not report chemical sales.

By company type, about $52.2 billion, or 39%, of chemical products was sold by chemical companies—firms with chemicals as their largest business segments. Diversified firms—companies that have the majority of their sales in products other than chemicals, petroleum, or natural gas—sold more than $35.1 billion in chemicals, or 26% of the total. Petroleum or natural gas producers sold more than $33 billion in chemicals for almost 25% of the total. Foreign-owned companies not disclosing chemical sales accounted for about 7%, whereas U.S. firms that did not break out chemical revenues made up about 3% of total sales.

Sales by company size



Sales by company type



Total 1983 U.S. chemical sales = $137 billion

a Also includes companies not disclosing chemical sales

Operating results improved for Second 50 chemical producers in 1983

Rank 1983	Rank 1982[a]		Chemical sales 1983 ($ millions)	Change from 1982	Chemical sales as % of total sales	Industry classification	Chemical operating profits[b] ($ millions)	Change from 1982	Chemical operating profits as % of total operating profits	Operating profit margin[c]	Identifiable chemical assets ($ millions)	Chemical assets as % of total assets	Operating return on chemical assets[d]
51	53	Pennwalt	$605	4.2%	62.0%	Basic chemicals	$ 43	−7.1%	58.1%	7.1%	$463	53.1%	9.3%
52	56	Uniroyal	593	15.0	29.1	Rubber products	65	54.9	40.6	11.0	465	31.3	14.0
53	48	Kaiser Aluminum	582	−9.3	20.4	Nonferrous metals	24	−43.9	def	4.2	488	13.9	5.0
54	50	Esmark[e]	580[f]	−7.8	14.1	Food	29	25.6	11.0	5.1	347	11.1	8.5
55	58	Witco Chemical	571	11.3	41.2	Specialty chemicals	54	40.2	36.2	9.5	276	37.7	19.6
56	54	Standard Oil (Ohio)	566	2.2	4.7	Petroleum	−3	def	def	def	642	3.9	def
57	55	Koppers	555[f]	3.7	35.4	Diversified	7	−14.8	8.4	1.3	316	26.9	2.3
58	45	Farmland Industries	542	−18.4	11.5	Agricultural supplies	−55	def	def	def	447	26.2	def
59	63	National Starch	508	8.8	67.1	Specialty chemicals	na	na	na	na	na	na	na
60	61	NL Industries	470	−1.4	33.8	Petroleum services	63	4.7	def	13.4	317	16.5	19.8
61	56	Sun Co.	467	−9.5	3.0	Petroleum	na	na	na	na	na	na	na
62	64	International Flavors	461	2.9	100.0	Specialty chemicals	111	9.3	100.0	24.0	432	94.2	25.6
63	62	Cabot[g]	460	−2.4	29.5	Specialty metals	44	−29.8	26.5	9.5	259	19.8	16.9
64	67	Beatrice Foods	453	6.1	20.3	Food	66	32.0	8.2	14.6	na	na	na
65	—	Morton Thiokol[h]	448	132.0	29.7	Diversified	47	168.2	27.3	10.5	533	46.3	8.9
66	65	Freeport-McMoRan	441	1.2	56.0	Agricultural chemicals	74	−21.0	52.0	16.8	235	16.6	31.6
67	60	Kerr-McGee	439	−10.1	12.5	Petroleum	−27	def	def	def	630	16.5	def
68	66	Polysar	436	1.5	100.0	Basic chemicals	na	na	na	na	na	na	na
69	72	H. B. Fuller[i]	426	28.2	100.0	Specialty chemicals	33	31.6	100.0	7.8	226	100.0	14.7
70	68	Henkel	400	1.5	100.0	Specialty chemicals	na	na	na	na	na	na	na
71	69	Pfizer	394	0.9	10.5	Drugs	5	def	0.7	1.3	394	10.0	1.3
72	70	Liquid Air	390	5.1	84.8	Basic chemicals	49	2.1	104.1	12.5	465	86.8	10.5
73	71	InterNorth	374	9.9	7.5	Natural gas	27	146.3	5.3	7.1	404	8.1	6.6
74	76	GAF	323	9.8	46.2	Specialty chemicals	65	16.4	211.1	20.0	198	47.8	32.6
75	84	American Petrofina	310	23.2	15.0	Petroleum	5	def	6.1	1.7	178	12.7	2.9
76	78	Houston Natural Gas[j]	305	9.9	10.3	Natural gas	34	7.0	10.8	11.0	387	14.2	8.7
77	74	Tyler	304	0.8	31.6	Diversified chemicals	22	51.7	31.7	7.2	158	31.6	13.9
78	85	Soltex	300	20.0	100.0	Basic chemicals	na	na	na	na	na	na	na
79	77	Big Three Industries	294	3.6	43.9	Petroleum services	71	−11.2	67.5	24.1	538	49.0	13.1
80	81	Upjohn	291	8.6	15.9	Drugs	−21	def	def	def	180	10.2	def
81	75	Rhône-Poulenc	290	−3.3	100.0	Specialty chemicals	na	na	na	na	na	na	na
82	87	Engelhard	273	10.2	24.9	Specialty metals	56	13.4	49.9	20.4	264	30.4	21.1
83	79	Petrolite[e]	267	−3.0	92.7	Specialty chemicals	33	−24.6	97.6	12.3	153	73.1	21.5
84	73	Mississippi Chemical[h]	263	−19.3	100.0	Farm cooperative	4	1333.3	100.0	1.6	343	100.0	1.3
85	83	Emhart	259	2.2	15.3	Machinery	24	2.6	15.6	9.2	113	11.1	21.1
86	82	Vulcan Materials	256	−2.7	31.2	Nonmetallic minerals	15	−67.3	16.4	5.7	na	na	na
87	91	Beker Industries	253	20.2	100.0	Agricultural chemicals	1	def	100.0	0.4	327	100.0	0.3
88	88	Chemed	252	9.4	92.8	Specialty chemicals	35	10.5	92.3	13.8	134	67.9	26.0
89	86	SCM[h]	251[f]	0.8	15.1	Paint	15	−32.6	16.5	6.0	267	24.0	5.7
90	80	Terra Chemicals	247	−9.5	100.0	Agricultural chemicals	na	na	na	na	173	100.0	na
91	93	Aluminum Co. of America	241	17.0	4.6	Nonferrous metals	na	na	na	na	na	na	na
92	94	Ferro	240[f]	16.9	38.8	Specialty materials	17	107.1	32.5	7.2	77	20.9	22.7
93	98	Great Lakes Chemical	226	33.2	100.0	Specialty chemicals	39	53.1	100.0	17.3	227	100.0	17.3
94	90	Loctite	216	−0.3	100.0	Specialty chemicals	29	17.3	100.0	13.5	213	100.0	13.7
95	89	Martin Marietta	214	−3.8	5.5	Aerospace	35	84.2	13.0	16.4	197	7.2	17.7
96	92	Stepan Chemical	207	−0.6	100.0	Specialty chemicals	11	20.7	100.0	5.4	145	100.0	7.7
97	—	Essex Chemical	169	11.2	100.0	Basic chemicals	17	−23.0	100.0	9.9	116	79.8	14.4
98	95	Agway	162	−16.0	4.3	Farm cooperative	na	na	na	na	na	na	na
99	—	UGI Corp.	149	−21.2	22.3	Natural gas	0	def	def	def	117	21.0	def
100	—	Sterling Drug	136	2.3	7.2	Diversified	7	56.5	2.8	5.3	112	7.6	6.4

a Revised. b Sales minus administrative expense and cost of selling. c Operating profit from chemicals as a percentage of chemical sales. d Operating profit as a percentage of identifiable assets. e Fiscal year ended Oct. 31, 1983. f Chemical sales include significant amounts of nonchemical products. g Fiscal year ended Sept. 30, 1983. h Fiscal year ended June 30, 1983. i Fiscal year ended Nov. 30, 1983. j Fiscal year ended July 31, 1983. **na** = not available. **def** = deficit.

Hence, operating profit margins (chemical operating profits as a percentage of chemical sales) for the Second 50 firms rose to an average of 7.9% in 1983 from 7.7% in 1982. And return on chemical assets for firms reporting consistent data increased to 8.9% from 8.7% the year before. Although these increases seem slight, the profitability is much higher than the average 6.7% profit margin and 7.2% return on assets for the Top 50 companies.

The largest increase in chemical sales among the Second 50 was registered by Morton Thiokol, with 132%. But this figure is misleading. Last year the company was omitted from the list, because it had not restated its results to include Thiokol's sales after the Morton-Norwich-Thiokol merger. This year, the sales from the combined companies are being compared with sales that include only part of the combined company in 1982.

After Morton Thiokol, the largest increase was reported by Great Lakes Chemical, whose sales rose 33% in 1983 over the year before. Other large sales increases were posted by H. B. Fuller, up 28%; and American Petrofina, up 23%.

In spite of the recovery, chemical sales increases were by no means universal. Of the Second 50 companies, 18 posted declines. The largest drop was 21% at UGI Corp., which is new to the list this year. Mississippi Chemical posted a 19% decline, and Farmland Industries an 18% decline; both are producers of agricultural chemicals, hard hit by government programs in 1983.

Four companies are new to the Second 50 list this year. In addition to UGI Corp., Morton Thiokol is back after including Thiokol's sales. It would have been on the list last year if these results had some way been restated. And for the first time Essex Chemical and Sterling Drug are ranked this year.

Of the companies that dropped off the list, only one—First Mississippi, another agricultural chemical firm—was because of declining sales. Airco, now called BOC Group Inc., no longer discloses chemical sales, and others such as Getty and El Paso have been acquired by other companies.

Second 50 fared worse than Top 50 in growth in 1983

Last year was a year of recovery from the profits-withering recession. However, larger chemical producers registered a stronger recovery in sales and operating profits than the medium-sized companies. But the medium-sized firms outperformed the larger ones in terms of profitability.

Sales growth for the Second 50 chemical producers averaged just 3.5% in 1983 over the year before, whereas earnings growth averaged, for the companies that report operating profits, 6.4%. By contrast, the Top 50 companies recorded an average sales growth of 6.3%, and an average earnings increase of 87%.

Since the Top 50 companies are largely producers of highly cyclical basic chemicals, it is no wonder that their growth reflects the cyclical nature of their products. The Second 50 firms by comparison are more heavily involved in lower-volume, higher-value-added specialty chemicals, which are not so cyclical as basic chemicals, and, because they are more downstream, tend to lag economic cycles. And because the products of the Second 50 are higher-value-added than the commodities produced by many of the Top 50 firms, it is not surprising that the group of medium-sized producers leads in profitability. Operating profits as a percentage of sales for the larger firms moved up to an average of 6.7% in 1983 from 3.8% the year before. Operating profit margins for the Second 50 increased to 7.9% from 7.7% in 1982.

The same pattern holds for return on identifiable assets: Larger producers registered an increase to 7.2% in 1983 from 4.3% in 1982, whereas medium-sized producers had an increase to 8.9% from 8.7% the year before.

Medium-sized firms increased their asset base in chemicals last year; the larger companies did not. Identifiable chemical assets for those medium-sized producers that split them out increased 6.8% in 1983 over the year before, whereas the chemical assets base of the larger producers declined an average of 2.4% during the year.

For the total 100 companies in 1983, chemical sales increased 7.3% and earnings jumped 67%, increasing the profit margin to 6.8% from 4.4% the year before. Assets for the group declined 1.3% and return on assets increased to 7.5% in 1983 from 4.9% the year before.

	Second 50	Top 50	Combined 100
Chemical sales, change from 1982	3.5%	6.3%	7.3%
Chemical operating profits, change from 1982	6.4	87	67.4
Chemical assets, change from 1982	6.8	−2.4	−1.3
Chemical operating profit margin, 1983	7.9	6.7	6.8
Return on identifiable chemical assets, 1982	8.9	7.2	7.5
	Number of companies on list		
Chemical companies	20	23	43
Petroleum and natural gas producers	7	13	20
Diversified and other	23	14	37
Foreign[a]	6	5	11

[a] Also included in above categories.

There was lots of movement in the rankings of the companies. Of those that were on the list in 1982, only one—Chemed—held the same rank (88th) in 1983. Of the remaining 45 firms that were on the list both years, 27 fell in ranking from 1982 to 1983, and 18 moved up on the list.

The largest fall in rank was registered by Farmland Industries, which dropped to 58th in 1983 from 45th on the list of Top 50 companies the year before. This was followed by Mississippi Chemical, which slipped to 84th from 73rd, and Terra Chemical, to 90th from 80th. The largest increases in ranking were recorded by Great Lakes Chemical, to 93rd from 98th; Soltex, to 78th from 85th; and American Petrofina, to 75th from 84th. □

C&EN's Top 100 chemical producers ranked five ways

	Chemical sales			Chemical operating profit			Chemical operating profit margin			Identifiable chemical assets			Return on chemical assets		
		Rank			Rank			Rank			Rank			Rank	
	1983	1983	1982	1983	1983	1982	1983	1983	1982	1983	1983	1982	1983	1983	1982
Agway	$ 162	98	95	na	—	—	na	—	—	na	—	—	na	—	—
Air Products	1,412	20	21	$ 196	11	7	13.9%	12	13	$1654	13	15	11.8%	31	26
Allied	2,337	11	14	224	8	15	9.6	31	43	1299	18	12	17.2	18	39
Aluminum Co. of America	241	91	93	na	—	—	na	—	—	na	—	—	na	—	—
American Cyanamid	1,719	18	18	106	23	18	6.2	49	44	1275	19	19	8.3	45	38
American Hoechst	1,222	26	28	na	—	—	na	—	—	na	—	—	na	—	—
American Petrofina	310	75	84	5	75	70	1.7	69	—	178	77	71	2.9	65	—
Ashland Oil	1,208	27	27	1	77	49	0.1	75	58	423	55	55	0.2	73	42
Atlantic Richfield	2,550	10	11	64	36	83	2.5	67	—	2603	8	8	2.5	67	—
Badische	671	48	59	30	56	71	4.4	61	—	513	47	48	5.7	57	—
BASF Wyandotte	1,034	35	38	20	64	69	1.9	68	—	726	38	37	2.7	66	—
Beatrice Foods	453	64	67	66	32	34	14.6	11	20	na	—	—	na	—	—
Beker Industries	253	87	91	1	77	74	0.4	74	—	327	63	63	0.3	72	—
Big Three Industries	294	79	77	71	28	23	24.1	1	1	538	45	46	13.1	28	15
Borden	1,295	24	25	138	16	22	10.6	25	40	1325	17	20	10.4	35	43
Borg-Warner	826	40	52	110	21	33	13.3	18	33	365	60	64	30.2	3	14
Cabot	460	63	62	44	45	27	9.5	32	15	259	69	67	16.9	19	5
Celanese	3,261	6	7	214	9	43	6.6	46	62	2869	7	7	7.5	47	58
CF Industries	862	39	37	34	52	84	4.0	64	—	1013	29	30	3.4	64	—
Chemed	252	88	88	35	49	48	13.8	13	14	134	82	82	26.0	5	2
Ciba-Geigy	1,290	25	23	na	—	—	na	—	—	na	—	—	na	—	—
Diamond Shamrock	942	37	33	12	70	26	1.3	71	41	1063	25	28	1.1	71	42
Dow Chemical	8,875	2	2	573	2	5	6.5	47	57	8193	1	1	7.0	50	53
Dow Corning	763	43	46	68	29	32	9.0	37	35	na	—	—	na	—	—
Du Pont	11,607	1	1	1144	1	2	9.9	28	52	7591	2	2	15.1	22	48
Eastman Kodak	2,285	13	12	214	9	6	9.4	34	27	2124	11	11	10.1	36	30
Eli Lilly	727	46	42	98	24	12	13.5	15	6	793	36	35	12.3	30	13
Emhart	259	85	83	24	60	54	9.2	36	29	113	85	83	21.1	10	7
Engelhard	273	82	87	56	39	35	20.4	3	4	264	68	70	21.1	10	9
Esmark	580	54	50	29	57	54	5.1	58	53	347	61	59	8.5	44	44
Essex Chemical	169	97	—	17	65	—	9.9	28	—	116	84	—	14.4	24	—
Ethyl	1,478	19	20	156	14	10	10.6	25	25	901	33	32	17.3	16	18
Exxon	8,439	3	3	348	4	37	4.1	63	64	4852	4	5	7.2	48	59
Farmland Industries	542	58	45	−55	89	72	def	—	—	447	53	47	def	—	—
Ferro	240	92	94	17	65	64	7.2	42	51	77	87	81	22.7	8	41
FMC	1,296	23	22	169	13	11	13.0	19	23	1063	25	25	15.9	20	20
Freeport-McMoRan	441	66	65	74	26	20	16.8	7	3	235	70	65	31.6	2	1
H. B. Fuller	426	69	72	33	54	52	7.8	40	38	226	72	71	14.7	23	25
GAF	323	74	76	65	34	30	20.0	4	5	198	74	76	32.6	1	3
Georgia-Pacific	683	47	51	64	36	24	9.4	34	19	1023	28	27	6.3	54	39
B. F. Goodrich	1,133	30	34	44	45	66	3.9	65	66	1214	20	24	3.6	62	62
W. R. Grace	2,760	9	9	324	5	3	11.7	22	20	1641	14	14	19.7	13	11
Great Lakes Chemical	226	93	98	39	48	50	17.3	6	12	227	71	73	17.3	16	22
Gulf Oil	1,748	17	16	−76	91	85	def	—	—	1009	30	21	def	—	—
Henkel	400	70	68	na	—	—	na	—	—	na	—	—	na	—	—
Hercules	2,007	15	15	121	18	25	6.0	51	53	1204	21	17	10.0	37	50
Houston Natural Gas	305	76	78	34	52	47	11.0	23	23	387	58	56	8.7	43	36
International Flavors	461	62	64	111	20	17	24.0	2	2	432	54	52	25.6	6	6
International Minerals	997	36	35	156	14	8	15.7	10	9	1377	16	18	11.4	32	23
InterNorth	374	73	71	27	59	61	7.1	44	56	404	56	57	6.6	52	60

	Chemical sales			Chemical operating profit			Chemical operating profit margin			Identifiable chemical assets			Return on chemical assets		
		Rank			Rank			Rank			Rank			Rank	
	1983	1983	1982	1983	1983	1982	1983	1983	1982	1983	1983	1982	1983	1983	1982
Kaiser Aluminum	582	53	48	24	60	39	4.2	62	42	488	49	45	5.0	60	34
Kerr-McGee	439	67	60	−27	87	73	def	—	—	630	43	39	def	—	—
Koppers	555	57	55	7	73	64	1.3	71	61	316	65	61	2.3	68	54
Liquid Air	390	72	70	49	43	36	12.5	20	16	465	50	50	10.5	34	28
Loctite	216	94	90	29	57	53	13.5	15	22	213	73	74	13.7	27	24
Lubrizol	800	41	41	109	22	16	13.6	14	17	683	40	42	15.9	20	12
Martin Marietta	214	95	89	35	49	58	16.4	9	32	197	75	69	17.7	15	36
Merck	606	50	49	52	41	29	8.6	38	28	592	44	43	8.8	42	28
Mississippi Chemical	263	84	73	4	76	67	1.6	70	67	343	62	58	1.3	69	62
Mobay	1,300	22	30	66	32	76	5.1	58	—	1168	22	22	5.7	57	—
Mobil	2,331	12	13	−16	85	62	def	—	64	2266	10	10	def	—	61
Monsanto	5,771	4	4	568	3	1	9.8	30	26	4498	5	4	12.6	29	31
Morton Thiokol	448	65	—	47	44	—	10.5	27	—	533	46	—	8.9	41	—
Nalco Chemical	659	49	47	118	19	19	17.8	5	11	489	48	49	24.0	7	8
National Distillers	785	42	44	68	29	46	8.6	38	46	683	40	40	9.9	38	46
National Starch	508	59	63	na	—	—	na	—	—	na	—	—	na	—	—
NL Industries	470	60	61	63	38	28	13.4	17	18	317	64	62	19.8	12	10
Occidental Petroleum	1,137	28	24	−12	82	50	def	—	59	985	32	23	def	—	56
Olin	1,111	33	36	68	29	30	6.1	50	45	1002	31	34	6.8	51	45
Pennwalt	605	51	53	43	47	37	7.1	44	35	463	52	51	9.3	39	27
Petrolite	267	83	79	33	54	39	12.3	21	10	153	80	80	21.5	9	4
Pfizer	394	71	69	5	75	68	1.3	71	—	394	57	54	1.3	69	—
Phillips Petroleum	2,255	14	10	83	24	54	3.7	66	63	1413	15	16	5.9	55	57
Polysar	436	68	66	na	—	—	na	—	—	na	—	—	na	—	—
PPG Industries	882	38	39	51	42	43	5.8	54	49	1152	23	26	4.4	61	52
Reichhold Chemicals	747	44	43	35	49	59	4.6	60	60	371	59	60	9.3	39	51
Rhône-Poulenc	290	81	75	na	—	—	na	—	—	na	—	—	na	—	—
Rohm & Haas	1,808	16	17	298	6	9	16.5	8	30	1038	27	29	28.7	4	19
SCM	251	89	86	15	67	57	6.0	51	30	267	67	66	5.7	57	35
Shell Oil	3,227	7	6	130	17	82	4.0	64	—	3759	6	6	3.5	63	—
Soltex	300	78	85	na	—	—	na	—	—	na	—	—	na	—	—
Standard Oil (Ind.)	2,906	8	8	173	12	14	6.0	51	47	2445	9	9	7.1	49	49
Standard Oil (Ohio)	566	56	54	−3	81	78	def	—	—	642	42	44	def	—	—
Standard Oil of Calif.	1,059	34	32	−12	82	75	def	—	—	780	37	36	def	—	—
Stauffer Chemical	1,340	21	19	−14	84	4	def	—	7	2048	12	13	def	—	16
Stepan Chemical	207	96	92	11	72	62	5.4	56	49	145	81	78	7.7	46	47
Sterling Drug	136	100	—	7	73	—	5.3	57	—	112	86	—	6.4	53	—
Sun Co.	467	61	56	na	—	—	na	—	—	na	—	—	na	—	—
Terra Chemicals	247	90	80	na	—	—	na	—	—	173	78	75	na	—	—
Texaco	1,137	28	26	−65	90	77	def	—	—	895	34	33	def	—	—
Tyler	304	77	74	22	62	59	7.2	42	47	158	79	79	13.9	26	33
UGI Corp.	149	99	—	0	80	—	def	—	—	117	83	—	def	—	—
Union Carbide	3,912	5	5	285	7	13	7.3	41	55	4917	3	3	5.8	56	55
Uniroyal	593	52	56	65	34	42	11.0	24	34	465	50	53	14.0	25	32
Unocal Corp.	1,133	30	29	74	26	21	6.5	47	37	699	39	38	10.6	33	21
Upjohn	291	80	81	−21	86	81	def	—	—	180	76	77	def	—	—
U.S. Steel	1,128	32	31	−27	87	80	def	—	—	1130	24	41	def	—	—
Vulcan Materials	256	86	82	15	67	39	5.7	55	8	na	—	—	na	—	—
Williams Cos.	740	45	40	1	77	79	0.1	75	—	894	35	31	0.1	74	—
Witco Chemical	571	55	58	54	40	43	9.5	32	39	276	66	68	19.6	14	17

Note: Companies with negative profitability are not included in rankings and companies not included in 1982's listing are not ranked for that year. **na** = not available. **def** = deficit.

Polymer output recouped much of 1982's losses

David Webber, C&EN New York

Accounting for the sharp earnings gains of the past few quarters, chemical company chief executives in many cases have been giving much of the credit to strong performance by their polymer business lines. Since the chemical industry recovery began, in fact, analysts have pointed to plastics and fibers as the leading elements in the rebound. Now C&EN's survey of polymer production in 1983 provides statistical proof of that characterization.

Last year, polymer output recovered sharply. Production of all types of plastics increased 16% after a 7.1% drop in 1982. Production of synthetic fibers shot up 17% after plummeting 19% the year before. And even output of synthetic rubber, the low-energy performer of the polymers sector, rose a solid 8.1% following a 9.5% decline in the 1982 slump. Overall, polymer production in the U.S. climbed almost 16% last year. The year before, it had fallen 9.9%.

As a result, polymer production regained much of the ground it lost during the recession year. In total, output of some 48.7 billion lb was higher than for any other year in history except 1979. That statistic distinctly underlines the quality of the polymers' recovery compared to that of basic chemicals. For C&EN's Top 50 chemical products, by contrast, 1983 total output remained far short of that of recent years despite a decent rebound. It is only back in 1976, in fact, that it is possible to find the most recent annual production total (other than that for 1982) that is lower than 1983's (C&EN, May 7, page 7).

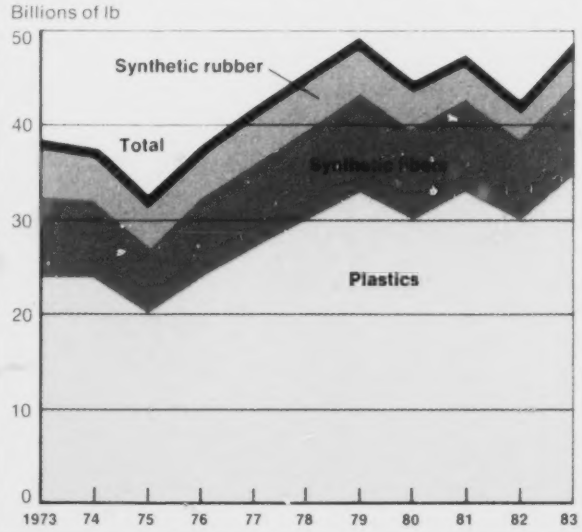
Still, polymer output looks less smashing in a longer perspective. Plastics, true, have managed a respectable compound growth rate for production of 3.4% over the past five years and 3.9% over the past 10 years. But fiber production has declined at an annual rate of 0.6% during the past half-decade. Since 1973, fiber output has expanded at an annual rate of just 1.1%. Synthetic rubber production statistics look even less exciting—declining at an annual 4.4% pace between 1978 and 1983 and shrinking some 2.6% a year over the past decade.

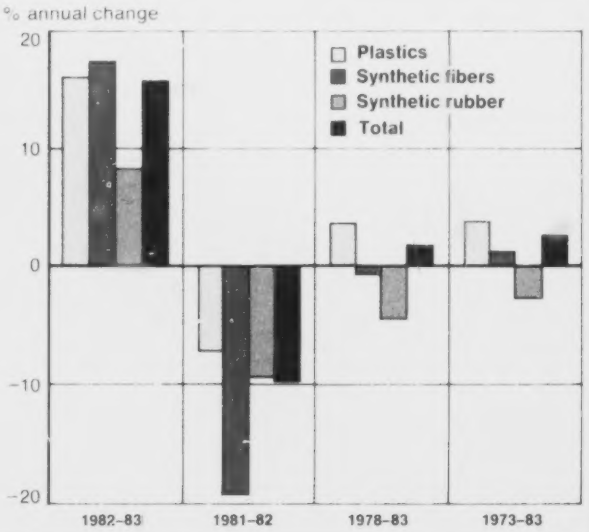
It is a measure of the harshness of the economic climate over the past five years that, whereas only six of 23 polymer products show average annual production declines since 1973, output of 11 of the products has shrunk since 1978. Among synthetic fibers, for example, both polyester and nylon output grew slightly over the 10-year span but have been declining since 1978. The same goes for polybutadiene among the synthetic elastomers. In the healthier plastics segment, production has increased for all products since 1973. Since 1978, only unsaturated polyester and melamine resins have decreased in output.

During 1983, the largest gain by a single segment was a 22% rise recorded by thermosetting resins, which account for some 15% of plastics poundage. Production of phenol, the most important thermoset, and other tar acid resins increased 24% in a year in which housing starts rose from 1.06 million to 1.70 million and the Federal Reserve Board's industrial production index for plywood, a major market for phenol products, shot up 29%. Among the thermoplastics, whose overall output rose 15% last year, the outstanding performers were polypropylene, polystyrene, and high-density polyethylene. In 1983, the automobile production index, an important indicator of plastic markets, rocketed 36%.

The big 18% increase in noncellulosic synthetic fiber production came in a year in which the industrial

Fibers led general recovery in production of polymers in 1983





Output of plastics, fibers, and rubber all rose in 1983

Production	Billions of lb		Common units					Average annual growth			
	1983	1982	1983	1982	1981	1978	1973	1982–83	1981–82	1978–83	1973–83
PLASTICS (millions of lb)											
Thermosetting resins	**5.25**	**4.31**	**5,247**	**4,313**	**5,010**	**4,449**	**3,698**	**21.7%**	**−13.9%**	**3.4%**	**3.6%**
Phenol and other tar acid resins	2.48	2.01	2,477	2,006	2,333	1,617	1,387	23.5	−14.0	8.9	6.0
Urea resins	1.17	1.00	1,172	998	1,165	1,122	867	17.4	−14.3	0.9	3.1
Polyesters (unsaturated)	1.08	0.87	1,084	865	997	1,209	1,051	25.3	−13.2	−2.2	0.3
Epoxies (unmodified)	0.33	0.29	334	286	336	299	223	16.8	−14.9	2.2	4.1
Melamine resins	0.18	0.16	180	158	179	202	170	13.9	−11.7	−2.3	0.6
Thermoplastic resins	**29.78**	**25.90**	**29,781**	**25,896**	**27,523**	**25,186**	**20,186**	**15.0%**	**−5.9%**	**3.4%**	**4.0%**
Low-density polyethylene	8.04	7.50	8,041	7,503	7,693	7,111	5,803	7.2	−2.5	2.5	3.3
PVC and copolymers	6.07	5.33	6,067	5,326	5,707	5,723	4,562	13.9	−6.7	1.2	2.9
High-density polyethylene	5.69	4.93	5,689	4,928	4,695	4,201	2,637	15.4	5.0	6.3	8.0
Polystyrene and copolymers	5.55	4.66	5,551	4,662	5,473	5,077	5,022	19.1	−14.8	1.8	1.0
Polypropylene and copolymers	4.43	3.48	4,433	3,477	3,955	3,074	2,162	27.5	−12.1	7.6	7.4
TOTAL[a]	**35.03**	**30.21**	**35,028**	**30,209**	**32,533**	**29,635**	**23,884**	**16.0%**	**−7.1%**	**3.4%**	**3.9%**
SYNTHETIC FIBERS (millions of lb)											
Cellulosics	**0.60**	**0.58**	**603**	**584**	**771**	**905**	**1,357**	**3.3%**	**−24.3%**	**−7.8%**	**−7.8%**
Rayon	0.38	0.39	375	388	509	597	895	−3.4	−23.8	−8.9	−8.3
Acetate[b]	0.23	0.20	228	196	262	308	462	16.3	−25.2	−5.8	−6.8
	8.69	**7.34**	**8,693**	**7,341**	**9,023**	**8,691**	**6,998**	**18.4%**	**−18.6%**	**0.0%**	**2.2%**
Polyester	3.54	3.17	3,543	3,168	4,173	3,800	2,901	11.8	−24.1	−1.4	2.0
Nylon[c]	2.42	1.93	2,418	1,927	2,333	2,550	2,175	25.5	−17.4	−1.1	1.1
Glass fiber	1.17	0.90	1,166	899	1,041	923	688	29.7	−13.6	4.8	5.4
Olefin	0.90	0.72	895	723	785	692	492	23.8	−7.9	5.3	6.2
Acrylic[d]	0.67	0.62	671	624	691	726	742	7.5	−9.7	−1.6	−1.0
TOTAL[a]	**9.30**	**7.93**	**9,296**	**7,925**	**9,794**	**9,596**	**8,355**	**17.3%**	**−19.1%**	**−0.6%**	**1.1%**
SYNTHETIC RUBBER (thousands of metric tons)											
Styrene-butadiene[e]	1.99	1.93	904	876	1,032	1,395	1,512	3.2%	−15.1%	−8.3%	−5.0%
Polybutadiene	0.73	0.64	333	288	342	377	332	15.6	−15.8	−2.5	0.0
Ethylene-propylene	0.39	0.27	175	123	178	174	118	42.3	−30.9	0.1	4.0
Neoprene	0.25	0.26	115	119	143	161	266	−3.4	−16.8	−6.5	−8.0
Nitrile	0.12	0.10	55	45	66	73	83	22.2	−31.8	−5.5	−4.0
Other[f]	0.87	0.83	396	378	261	292	274	4.8	44.8	6.3	3.8
TOTAL[a]	**4.36**	**4.03**	**1,978**	**1,829**	**2,022**	**2,472**	**2,585**	**8.1%**	**−9.5%**	**−4.4%**	**−2.6%**

a Totals are for those products listed. Totals may not add because of rounding. b Includes diacetate and triacetate yarn. Does not include cigarette filters. c Includes aramid. d Includes modacrylic. e Excludes high-styrene latex. f Includes butyl, polyisoprene, chlorosulfonated polyethylene, polyisobutylene, and acrylo, fluoro, polysulfide, and silicone elastomers. Before 1982, butyl and polyisoprene were reported separately; they have been added retroactively to "other" here.

production index for textile mill products rose 13%. Nylon output's 26% explosion reflected a 23% rise in the government's carpeting production index. The other big increases in synthetic fiber output were registered by glass and olefin fibers. The Federal Reserve Board's index of man-made fiber production rose 16% in 1983.

Production of synthetic rubber products reflected increases in the government's production indexes as well. The index of tire output, for instance, climbed 11%; that for rubber products, excluding tires, rose 5.5% in 1983. Among the elastomers, the biggest increase in production was notched by ethylene-propylene rubber, up 42% last year.

The production increases throughout the polymers industry helped raise capacity utilization rates. Low-density polyethylene capacity utilization increased from 76% of nameplate capacity in late 1982 to 79.6% in 1983. Utilization of high-density polyethylene nameplate capacity rose from 82% in 1982 to 90.3% last year.

For polyvinyl chloride, the utilization rate jumped from 59% in 1982 to 68% in 1983. For polypropylene, the capacity utilization rate rose from 61% in 1982 to 86.9% last year.

Utilization of synthetic fiber production capacity increased even more sharply overall. Output of polyester fiber, for example, rose to 82.3% last year. For nylon, the 1983 capacity utilization rate reached 83.7%. Production of olefin fibers, which was using up some 60% of nameplate capacity in late 1982, required nearly 82% of total capacity in 1983.

With the improvement in polymer capacity utilization rates has come an increase in announcements of plant expansions. Northern Petrochemical, for example, plans to expand capacity of its Morris, Ill., polypropylene facility to 220 million lb per year via debottlenecking. Shintech is increasing the capacity of its Freeport, Tex., polyvinyl chloride unit to 1 billion lb per year, and, in February, Air Products finished boosting capacity of its PVC plants to 500 million lb per year. □

Drug profits climb 12% overall in mixed results

Major pharmaceutical houses recorded a solid 12% gain in earnings in this year's first quarter, but results varied widely. Several companies in a group of 17 achieved record sales and earnings, but three reported a profit decline. For the group, sales increased 6%. Overall profitability, measured as after-tax income as a percentage of sales, rose to 11.3% in this year's first quarter from 10.7% in first-quarter 1983. This profit margin also was up slightly from the overall 11.1% recorded in fourth-quarter 1983.

The strength of the dollar overseas continued to bite into the bottom line. American Home Products, for instance, points out that despite overall unit growth, its foreign sales fell 6% expressed in dollars. Pfizer chief executive Edmund T. Pratt Jr. notes that Pfizer global sales rose 5% in local currencies but only 1% in dollars. E. Claiborne Robins Jr., chief executive of A. H. Robins, says that foreign exchange rates reduced that company's revenue $5.2 million. Currency translation cut corporate sales $21 million at SmithKline Beckman. Abbott Laboratories, Eli Lilly, Schering-Plough, G. D. Searle, and Squibb all explained that exchange rates hurt total sales figures.

But there also were signs that the depredations of the strong dollar are abating in some cases. Merck, for instance, says that although currency exchange continues to have an unfavorable effect on sales, the impact has moderated. At Warner-Lambert, where profit rose 18%, chairman Ward S. Hagan notes, "We attribute the first-quarter gain to the strong performance of our domestic operations and an improvement in foreign currency."

At the same time, nationwide efforts to trim health care spending have begun to affect pharmaceutical houses. Warner-Lambert, for one, explains that slower sales growth for its health technology products stems from reduced hospital admissions, shorter hospital stays, less surgery, and the new medicare reimbursement schedule, among other factors. Becton Dickinson, whose 23% earnings decline made it the worst performer in the group, registered a 1.3% revenue drop in its chief business segment, medical products. Again, the main reason cited was the slowdown in hospital admissions.

However, Abbott Labs, with a 17% income gain, says it was helped by the trend toward health care cost containment. "We've repeatedly said that the changes occurring in health care today represent opportunities for those companies that can provide the cost-effective products being demanded by the marketplace," comments Robert A. Schoellhorn, chief executive officer. "That's precisely what we're doing, and we're well on our way to another record year." Sales of the company's hospital and laboratory products rose 9% in the quarter, compared to a corporate revenue increase of 6%.

Record sales and earnings were reported by Abbott Labs, American Home Products, Eli Lilly, and Squibb. A. H. Robins reported record sales. The sharpest increase came at Searle, with earnings up 52% on a revenue gain of 41%. Searle, continuing to ride the aspartame rocket, also reported a slight improvement in its prescription drug segment.

Other companies were helped by sales of products not related to health care. Eli Lilly, for example, reported an 8% increase in both sales and earnings for the first quarter. Chairman Richard D. Wood gave much of the credit to strong sales gains by agricultural chemicals, particularly by the herbicides Treflan and Sonalan. At Sterling Drug, where overall net income rose 9% on a marginal revenue increase, sales climbed 6% in the company's chemicals and other products segment. And at Upjohn, where chemical product lines account for some 16% of total sales, chemical segment sales rose 14% from last year's first quarter.

At SmithKline Beckman, there was a solid sales increase for the company's bioanalytical systems operation. "This is a result of the rollout of new products and an upturn in both the bioresearch and biotechnology markets," said the company's chief executive officer, Henry Wendt. "We're also encouraged by incoming order patterns in this business."

The industry leaders ranked by sales were American Home Products, Bristol-Myers, Pfizer, Lilly, and Merck. The earnings leaders were American Home Products, Lilly, SmithKline Beckman, Pfizer, and Merck. And profitability leaders were SmithKline Beckman, Lilly, Merck, A. H. Robins, and Pfizer.

David Webber, New York

Pharmaceutical earnings rose 12% in the first quarter

	FIRST-QUARTER 1984					
	Sales	Earnings[a]	Change from 1983		Profit margin[b]	
Company	($ millions)		Sales	Earnings	1984	1983
Abbott Labs	$ 721.1	$ 87.7	6%	17%	12.2%	11.1%
American Home Products	1282.3	175.3	5	10	13.7	13.0
Avon Products	692.2	26.7	4	0	3.9	4.0
Becton Dickinson	285.6	13.6	3	−23	4.8	6.4
Bristol-Myers	1056.0	110.0	10	19	10.4	9.6
Eli Lilly	894.8	146.7	8	8	16.4	16.4
Merck	848.6	125.1	10	10	14.7	14.8
Pfizer	919.8	127.7	1	15	13.9	12.2
Revlon	564.0	24.5	2	3	4.3	4.3
A. H. Robins	156.3	22.4	14	43	14.4	11.4
Schering-Plough	486.5	53.3	3	−4	11.0	11.8
G. D. Searle	280.3	25.3	41	52	9.0	8.3
SmithKline Beckman	718.7	130.5	6	4	18.2	18.5
Squibb	428.9	36.9	6	11	8.6	8.2
Sterling Drug	447.0	30.2	1	9	6.8	6.3
Upjohn	563.0	65.0	16	43	11.5	9.4
Warner-Lambert	777.4	54.2	2	18	7.0	6.0

a Excludes significant extraordinary and nonrecurring items. b After-tax income as a percentage of sales.